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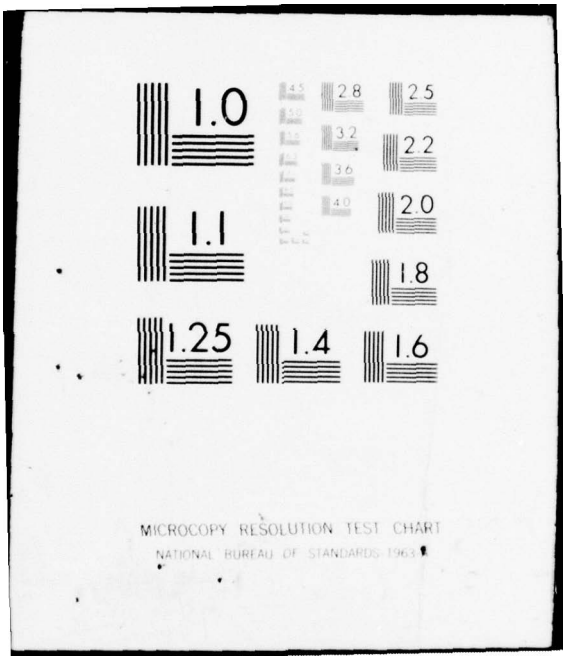
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TRAINING PLANNING IN THE ACQUISITION PROCESS MUST KEEP PACE WITH CHANGING TRAINING TRENDS

Study Project Report
Class 76-2

Hogan M. Wilson
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FORT BELVOIR, VIRGINIA 22060

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DEFENSE SYSTEMS MANAGEMENT COLLEGE

STUDY TITLE:

Training Planning in the Acquisition Process Must Keep Pace With Changing Training Trends

STUDY PROJECT GOALS:

To identify the process for integrating training into the total planning process of systems acquisition within the Army.

To identify the changing trends in training within the Army and their impact on the PM of an Army weapon system.

STUDY REPORT ABSTRACT:

The purpose of this study was to investigate the process for integrating training into the system acquisition process and the impact of changing training trends within the Army on the Project Manager. The report discusses the acquisition environment from the training standpoint and the need for a total systems view which includes the man-machine interface. The integrating process is presented as one of refining a general training plan toward specific outputs throughout the life cycle phases.

The Army training environment is reviewed from the institutionally based system which existed prior to 1972 to the system that exists today which is characterized by the concept of decentralized training with an emphasis on performance at the man-machine interface point. This process of change has been supported by increased emphasis on improved media and documentation which is exported from the service school "factory" to the using command. The latest of the changes is a program of Improved Technical Documentation and Training which is reviewed and included in an analysis of the impact of the changing training trends on the Project Manager.

The report should be of interest to newcomers to the field of program management in the area of Integrated Logistics Support, specifically in the personnel and training area.

KEY WORDS: Training; Program-Manager; ITDT; NET; Performance-Oriented; Man-Machine; ILS

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TRAINING PLANNING IN THE ACQUISITION PROCESS MUST KEEP PACE WITH CHANGING TRAINING TRENDS

Study Project Report

Individual Study Program

Defense Systems Management College

Program Management Course

Class 76-2

by

Hogan M. Wilson
MAJ USA

November 1976

Study Project Advisor
CDR Gerald J. Chasko

This study project report represents the views, conclusions and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management College or the Department of Defense.

DEFENSE SYSTEMS MANAGEMENT COLLEGE

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EXECUTIVE SUMMARY

The goal of this paper is to report on a study of the process of integrating training into the acquisition process of U. S. Army weapon systems, with a view toward the impact on the PM of changing training trends within the Army.

The PM must plan for training within his program in an environment of constrained budgets where high technology weapons impact unfavorably on the ability of the ultimate user to practice with the system. At the same time, the user must be prepared to effectively use the system in winning the first battle. The process of planning for integration of training is one that moves from the general to the specific in consonance with the hardware subsystem as the life cycle proceeds. The PMO is the managing coordinator for training with the principle functional participant being the U. S. Army Training and Doctrine Command (TRADOC). The PM, as the developer, has responsibility for the transfer of knowledge from the contractor to the user. This is done through the "New Equipment Training" concept.

The training environment within the Army has undergone significant changes since 1972 with emphasis on decentralized, performance oriented training. The thrust of the emphasis is that the soldier attains specific equipment proficiency at the point of man-machine interface in the using unit, not in the service school. This approach incorporates a "factory" mission for the service school to export the means of training to the unit. The newest approach in this area is called Improved Technical Documentation and Training (ITDT), where the new training trends are combined with an

effort to improve on documentation useability for the user. The essence of the approach is that the PM will manage the development of a training system of extension courses along with the development of system hardware. The program is in a pilot project mode currently, but estimates of its impact are encouraging for reducing O&M costs by increased front-end costs.

The study reveals that the increasing emphasis on training within the Army since 1972 has significant impact on the PM. Therefore it is recommended that the PM be cognizant of the rationale underlying the changes. Further, it is recommended that he plan for the increasing importance of the interface of his ILS training element with TRADOC to insure an early commitment to the project from the functional training specialist.

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SECTION I

INTRODUCTION

"Exercise of the military art has always involved understanding that the weapon system includes man. Military equipment is effective in battle only to the degree that soldiers who put it to use are trained to exploit its potential." (20:I-1)[1] Implicit in any weapons system development, if we are developing weapons systems instead of hardware, is the need for appropriate attention to the subsystem "man" as he interfaces with the hardware subsystem.

Purpose

The purpose of this paper is to examine the man-machine interface of the weapon systems acquisition process in the area of training. The paper is the result of a study effort on the part of the writer to improve his understanding in the area of integrating training into the process of acquiring U. S. Army weapons system with a view toward the future.

Scope and Limitations

The paper includes a review of the environment of the systems acquisition process as it pertains to the issue of training, an identification of the current methodology for integrating training into the acquisition process, and a review of the current training trends within the Army. It includes a review of an embryonic program to improve technical documentation and training and an estimate of the impact of the changing training trends on the Project Manager (PM) of U. S. Army systems. The study is limited to a consideration of training in the development of U. S. Army systems except

[1] This notation will be used throughout the report for sources of quotations and major references. The first number is the source listed in the bibliography. The second number is the page in the reference.

where analogy or examples from other services contribute to the overall issue.

Author's Viewpoint

In the roles of a Commander and Staff Officer, I have been involved with the receipt of initial issues of two pieces of relatively sophisticated electronics equipment. Both equipments were received with enthusiasm and initially increased the unit's ability to perform its mission. In a matter of weeks, after the departure of the New Equipment Training Teams, the unit experienced significant maintenance and operations difficulty on both equipments resulting in reduced mission capability. Initial analysis of the problems concluded that the equipments had not been properly designed for the mission. With hindsight, I have concluded that the problem stemmed more from inadequate training of the operators, maintenance personnel, and supervisors for which the leadership of the unit was ultimately responsible. However, it is clear that the means for training personnel in the skills required to effectively employ and maintain the equipments were neither readily at-hand nor adequate.

This study project has afforded me the opportunity to investigate the process of how training is integrated into the acquisition process with a view toward improving the end-result effectiveness of the total system.

SECTION II

THE ENVIRONMENT

An Assumption

At some time, in some place, soldiers of the U. S. Army will again be ordered into battle. Certain assumptions about that battle are valid: the enemy will possess weapons as effective as ours, perhaps more effective; and he will possess them in greater numbers than we are likely to deploy. The arms balance is such, and the voraciousness of modern battle loss is such, that the first battle of the next war may very well be its last battle. The processes of conflict termination will set in, and the United States will have to live with an outcome dictated by the results of the initial combats. In any case, the first battle must be won in order to be in an advantageous position either for conflict termination or for subsequent battles. The Army's present circumstance is historically unprecedented; we are an Army accustomed to losing first battles and a nation used to reliance on weight of industry and population brought to bear after the guns begin to roar. The leaders of today's Army must, above all else, find a way to prepare in peacetime to assure winning that first battle of the next war. (20:I-1)

A Conceptual Approach

On October 5 of this year, the intelligence community confirmed that the Soviet Union was outspending the U. S. by 85% in terms of defense procurements. (5:1) Dr. Malcolm Currie, Director of Defense Research and Engineering, in justifying of the FY 77 Defense Budget said that the United States

> ...still holds a lead in basic military technology over the Soviet Union in most areas important to national security. (9:1)

But he added that desiveness does not rest on

> ...simply technology itself, but on the combination of technological quality and the numbers of deployed weapons embodying that technology. (9:1)

One approach to the above realities would be a larger appropriation for new weapons systems to take advantage of the country's leading edge in technology. This approach, however, is impractical in the light of the general economic recession and the demand by the public for increased congressional attention to "quality of life" programs. Additionally, there is increasing concern for the fact that a disproportionate share of the total defense budget is attributable to "people cost." Thus a better approach amounts to getting the maximum effectiveness from those weapons systems deployed and those being developed.

Headquarters, U. S. Army Training and Doctrine Command, (TRADOC) who represents both the user and the trainer of army systems has provided a conceptual model for evaluating effectiveness.

$$E = f(W,P,T)$$

Where: W = the capability of the materiel
P = the proficiency of the soldiers manning it
T = the tactics of employment (20:II-2)

The tactics component is a measure of the influence of commanders ordering the employment of the man-machine system in battle. The PM of U. S. Army weapons system is more directly involved with the first two components; the weapon itself, and the proficiency of the soldier using and maintaining it. The latter is directly related to training.

The Training Dilemma

In a paper prepared for the Inter-Service Conference on Defense Policy in 1972 the impact of high technology weapons on the training environment was summarized as follows:

1. The high cost of new systems inevitably produces a plethora of "safety" rules which inhibit essential realistic training, for the loss or damage of a unit of equipment is prohibitively expensive.

2. The very high cost per operation hour limits the amount of training time because peacetime pressures are always in the direction of cutting O&M budgets to pay for procurement.

3. The net availability of manpower is sharply reduced by the complexity of the equipment, which requires more time in technical schools and more manpower in maintenance, particularly for the high skill levels, where we have the greatest shortages.

4. More people are required throughout the entire supporting structure, thus decreasing our already low ratio of combat manpower to logistics personnel ("tooth-to-tail" ratio).

5. Training is further drastically curtailed by the much greater cost of associated munitions, particularly guided weapons (many pilots and soldiers are already familiar with the problems of being allowed less than one live firing of their principal weapon per year.) (7:8)

The PM of a U. S. Army weapon system finds himself at the heart of the above environment. He is responsible for managing the development of a weapon system which capitalizes on this country's lead in technology and is faced with a detrimental effect of that technology on training which he, as a military man, knows is absolutely essential to its total effectiveness. His objective is to manage a program of developing and fielding a weapons system which is;

> ...capable of being effectively manned and supported in any environment, and under all conditions of war.
> ...logistically supportable, can be procured within budget constraints, and are cost and operationally effective. (11:1-1)

In reaching his objective he must be concerned with two additional realities. One is the need to prepare for the potential sale of the weapons system to a foreign government. Secondly is the impact of the "Total Force" concept wherein the Reserve and National Guard -

____must be trained in modern technology

____must be equipped with up-to-date weapons. (10:3)

The following sections focus on some considerations of this environment for the PM. The process of integrating training into the development cycle is examined in Section III and the training environment is considered in Section IV.

SECTION III

THE INTEGRATING PROCESS

The process of integrating training into the weapons development life cycle is an evolutionary one which moves from the general to the specific in consonance with the materiel system. In the early stages of the life cycle the output of the training planning process has two facets. First is in the area of design where consideration of the training methodology along with human factors engineering impacts on the engineering design of the conceptual system. The second is a training strategy to be used for the fielded system which is focused on insuring that trained personnel will be available when the system is deployed and that the system remains operationally capable. There is no distinct separation between these two aspects, for each bears upon the other. As the life cycle proceeds, the character of training planning gets more specific in terms of the participants involved and their interactions with other elements of the development process. The following sections look at the phases of the life cycle in greater detail.

Conceptual Phase

The initial training planning during the conceptual phase is part of the consideration by the combat developer in analyzing the operational capability objective. In the Army this is done by Headquarters, U. S. Army Training and Doctrine Command (TRADOC). TRADOC supports the HQDA Special Task Force in its mission of analyzing alternatives through a Cost and Operational Effectiveness Analysis (COEA). In viewing the overall deficiency, the various hardware approaches are analyzed along with alternative

training subsystems, in a total systems approach.

Until recently the COEA did not reflect the total systems approach, in that the training subsystem was considered relatively fixed for each hardware alternative. Thus, the analysis centered on hardware only, without regard to maximizing the total system effectiveness through improved training subsystems. The "has been" COEA in concept was as follows:

Compare: S_0 S_1 S_2

$\begin{bmatrix} H_0 \\ T_0 \end{bmatrix}$ to $\begin{bmatrix} H_1 \\ T_0 \end{bmatrix}$ to $\begin{bmatrix} H_2 \\ T_0 \end{bmatrix}$

Where: S = weapons system concept
H = hardware subsystem
T = training subsystem (20:III-5)

The current COEA implements an improved total systems view by considering multiple training subsystem alternatives for each variation of the weapon system concept, as follows:

Compare: S_0 S_1 S_2

$\begin{bmatrix} H_0 \\ T_0 \end{bmatrix}$ to $\begin{bmatrix} H_1 \\ T_1 \end{bmatrix}$ to $\begin{bmatrix} H_2 \\ T_2 \end{bmatrix}$

Or perhaps: $\begin{bmatrix} H_0 \\ \\ T_0 \end{bmatrix}$ to $\begin{bmatrix} H_1 \\ \\ T_1 \end{bmatrix}$ to $\begin{bmatrix} H_2 \\ \\ T_1 \end{bmatrix}$ (20:III-5)

Considering multiple training alternatives has been enhanced by the changing trends in training which began in the Army around 1972. These trends will be discussed in Section IV. The significance of the process

at this point has to do with the participants involved and the output.

(a) Participants - In the Army the ultimate users of the weapon system are the Commanders of forces such as U. S. Army Forces Command (FORSCOM) and the Army Component Commanders of the Unified and Specified Commands. In weapons system development they are represented by TRADOC who is responsible for training and doctrine including training within service schools. TRADOC has overall training responsibility which includes both operational and maintenance training. Thus TRADOC, the combat developer and trainer, takes the lead role at the initial stages of development in setting the parameters for training.

(b) Output - The output of the training planning in this phase is the general training plan which is incorporated into the Concept Formulation Package and the Outline Development Plan. These two documents are the essence of the PM's roadmap throughout the development life cycle.

Validation Phase

Given the training concept from the conceptual stage, the PM becomes the central point for coordination and refinement of the training subsystem as it begins to take shape with the hardware and personnel requirements. Two parts of the validation phase provide the means for refining the training plans. First is the prototype hardware or brass board configuration of the hardware subsystem and second, Operational Test I (OT I).

While prototype hardware is usually not very similar to the final product, it does give a first approximation of the man-machine interfaces. Here human factors engineering analysis can be used to provide feedback for advanced engineering design. OT I with user personnel, provides a basis for a general assessment of the skills and qualifications likely to be needed by using and maintenance personnel. (15:3)

Personnel requirements estimates in the validation phase lead to a Provisional Qualitative and Quantitative Personnel Requirements Information (PQQPRI) report. This information along with an updated Training Support Plan and a Basis of Issue Plan are input to the Army Military Personnel Center (MILPERCEN) for evaluation of the "people" requirements for the system. Given the existing environment of the high "people-cost" this evaluation along with its periodic updates becomes critical in terms of refining the O&M portion of the life cycle cost estimate.

Gross manpower requirements are thus surfaced in validation in the areas of operator's required in Tables or Organization and Equipment (TOE), maintenance personnel from the Logistics Support Analysis (LSA), and MOS's required (new and upgraded) in the area of trainers within the service schools. Hq TRADOC representing the trainer, user, and combat developer repeats the COEA as the proposed training subsystem becomes refined with its personnel and support cost data becoming more specific.

Current regulations (AR71-5, 71-7 and 750-1) require separate outputs of training planning in the validation stage. One is the Advanced Resident Training Plan (ARTP) whereby TRADOC plans for future training in terms of courses, school quotas and course lengths. The other is the New Equipment

Training Plan (NET) that focuses on the transfer of knowledge from the material developer (PM and Contractor) to the trainer, testor, and user. The NET Plan has both short and long term objectives. In the short term it is concerned with the training of user personnel, usually at the contractor's site to facilitate OT II. In the long term it is concerned with supporting the trainer by training a cadre of instructor personnel who will become the means for training initially equipped using and support units. While the two plans have different objectives, the NET plan should be supportive of the ARTP and the ARTP must support the user requirements and the logistics support concept. From an organizational perspective both plans are submitted for HQDA review from two of its major commands; DARCOM (NET), and TRADOC (ARTP). (17:C-8)

From the PM standpoint, the validation phase is where the first estimates of the character of the hardware system becomes evidenced and the skills and tasks required of users can be estimated more realistically. The PM is the central figure in this coordination between trainer-user-developer with regard to the man-machine interface. The results of this coordinated planning is incorporated into his Development Plan, which, if approved at DSARC II becomes an allocated baseline for future work.

Full Scale Development and Production Phases

In FSD, the training subsystem moves from the general to the specific along with the hardware design. For the hardware and the training subsystem it is a matter of refining and updating the plans laid out in the validation phase. The NET Plan becomes operative by training personnel for OT II. The output of OT II becomes the basis for refining personnel estimates and the

corresponding training requirements. Tasks required for users and maintenance personnel become more specific as the product baseline of the hardware takes shape.

Draft field manuals (FMs) and technical manuals (TMs) are prepared and the training programs are laid out with increased specificity in order to be evaluated in OT III. As the system moves into the production phase, first edition FM's and TM's are prepared and evaluated and revised as necessary for distribution to initial delivery units. Training programs in proponent branch service schools are begun following NET sessions at the contractor facilities for cadre personnel.

Under current procedures NET is equipment oriented. It's concept is to insure that there will be:

> ...trained personnel available at all levels of maintenance who know how to maintain and repair the item when it is first issued to the field. (6:12)

The concept is aimed at providing the link of transferability from developer to supporter.

TRADOC's task is people oriented and is the "how" of training. It maintains responsibility for:

> ...individual training on a skill or MOS basis, whereas, the NET program trains personnel for a single item or system. (6:12)

When TRADOC plans instruction on a new piece of equipment

> ...they add only the additional or particular skills and knowledge required for operation or maintenance of the vehicle to the existing MOS-producing course. (6:12)

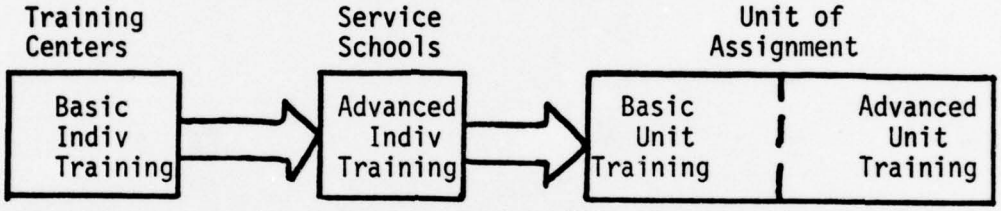
The common thread between the above two types of training is documentation in the form of FM's and TM's which have been the primary documentation to support the equipment and the training system. Approval of FM's is under purview of the trainer while TM's are under the purview of the developer, with the PM as the coordinating link in the process. The preparation and actual production of the manuals are the PM's responsibility. If the PM is to be an effective link he must understand the environment in which the documentation is used. Section IV addresses this area.

SECTION IV

THE CHANGING TRAINING ENVIRONMENT

Background

From World War II through the late 60's and the Army's general model for training was institutionally based. The cycle proceeded from the CONUS based training centers to service schools which produced MOS trained personnel for units authorized specific MOS's. There were essentially four elements of the training cycle which were conducted at three locations as follows:



The concept was based on the need for mobilization whereby the individual arrived at his unit of assignment with the service school taught skills to perform his job. The unit was to provide him the opportunity to practice those skills as part of a team effort.

In the late 60's several factors made the 25 year old system infeasible in terms of assuring fighting efficiency.

(a) Increased personnel turbulence during the Viet Nam War impacted on both the baseline of service school expertise and the time the individual was stabilized in a crew or within one unit.

(b) Proliferation of equipments for a given MOS meant that the service schools had to prepare one man for multiple models and types of the same generic functional equipment.

(c) Sophistication of equipment meant higher technical skills were required of both operators and maintenance personnel.

The above factors essentially came together in an overall timing deficiency. The institutionally based system could not increase the training of personnel at a rate that was commensurate with the rate of increase in new weapons being fielded. This deficiency was noted in fielding one of the most basic of Army weapons--the M16. The Ichord Subcommittee of the House Armed Services Committee noted in its investigation of that weapon's alledged deficiences, "a lack of adequate training on care and cleaning as a significant deficiency of the weapon" in the hands of front line troops. (22:10)

Decentralization

In the early 70's the Army began to react to deficiencies of the institutionally based training system with the concept of "Decentralized Training." The concept basically acknowledged that specific skills on specific equipment must be taught at the unit level based on the unit commander's assessment of the need. With this concept higher command training guidance in terms of specific training programs was abolished. Responsibility for the soldier's development of the required proficiency on a specific equipment type was that of the company and battalion level commander.

Experience with decentralized training surfaced two major problems.

(a) The literature available to the unit commander was inadequate. TM's and FM's, it was found, were written for personnel with reading skills in the area of grade level 12-14 and the average reading skill of the soldiers using the manuals was grade level 8-10.

(b) The evaluation of the soldiers, which impacted on their promotion, was still based on MOS tests and therefore required them to be proficient on multiple equipment types. This apparent unfairness to the soldier surfaced simultaneously with the transition to the Volunteer Army and received considerable visibility.

The Chief of Staff, U. S. Army organized the Board For Dynamic Training in mid-1971 to conduct a study of Army training and training management. (23:21) Since that date there has been a virtual revolution in terms of orientation, methodology, and media of training within the Army, and a new organizational structure has developed to support it.

Performance Orientation

The primary focus of the new training trends is embodied in the concept of "performance oriented training." The concept simply says that training should prepare the personnel to do the job. The performance is emphasized. It implicitly says that in the case of an equipment operator it may not be necessary for him to understand the theory. Instead, it is important for him to be able to perform. Performance oriented training means that the training planner identifies and specifies the tasks to be performed, the conditions under which the tasks are to be performed, and the standard or criteria by which the individual is evaluated. All training then becomes task oriented where the trainee trains to the task. (19:4)

A prerequisite for performance oriented training is a front-end analysis of the job involved. The job and task analysis point out the ultimate objective of the training (i.e., the performance desired at the end of the training). The thrust of the analysis is to begin with a job and break it

down to the duties of the job which is further broken down to the tasks and subtasks required. The end result of the analysis is an identification of the basic skills which must be acquired by the operator. By breaking down the task into subtasks required for job performance, the analyst can omit those areas which are not essential to the performance of a more senior task. (Example, in order for a rifleman to be able to fire his weapon, it is not necessary that he know the weight of the weapon, nor the muzzle velocity. The performance desired is that he be able to fire the weapon accurately under stated conditions to a certain standard.)

Included in the front-end analysis of a job are two additional aspects which bear considerably on the training plan. Once the job has been analyzed to determine the tasks of the job, two questions must be answered. First, is which of the tasks have to be learned? That is, given the target population for the job, is it really necessary to teach each man all of the subtasks or are some of the subtasks already within the capability of the individuals. Second, for those tasks to be taught, what is the best instructional setting? Options range from job performance aids to be used at the unit level to formal schooling at service schools. Between those extremes are self-teaching packages, on-the-job training, or installation level support schools. Thus the output of the analysis is, given the job and the man, what is the best technique for having him become proficient at the performance required.

Methodology

In 1974, HQ TRADOC required each of the service schools to organize a Directorate of Training Development which would be analagous to a "factory"

that would export training to the field. The concept came from the realization that soldiers spend 90% of their time in units, and it is in units where he interfaces with the specific equipment. Each of the schools was directed to perform a front-end analysis of all MOS courses taught in the school under a program of Instructional System Development Methodology. The factory concept was superimposed on this procedure to provide the field with the same essential material used in the schools. The primary function of the factory is to convert the material to self-paced, exportable packages so the service school expertise could be available to the soldier at the point of his job. The concept fills three gaps existing in the field. First, when a soldier changes units or models of the same generic equipment type, he can train without being recycled to the school. Second, the exportable packages, accessible to the individual in the field, provides reinforcement of service school taught skills or refresher training when needed. Third, the methodology of having the training package in the unit provides the unit commander with the means for training without having to establish a "local unit school" which he is not organized to do.

Under this methodology the service schools for each of the branches remain the center of expertise. They continue to run Advanced Individual Training (AIT), but do not expect to turn out experts on all the models of equipment for a particular MOS. Proficiency is to be gained in the unit. The role of the service school is to teach those skills which cannot adequately be taught in the field such as those requiring high ratios of instructors to students and those requiring high-cost trainers or simulators.

Media

In support of the new concepts mentioned above, training media has received considerable attention. In addition to supporting the concepts of "performance orientation" and "decentralized training" the media revisions addressed the problems of literature useability. The following are specific examples:

Soldiers Manuals (SM) - SM's are easily readable manuals aimed at a specific MOS describing the tasks, conditions, and standards which the soldier in that MOS is expected to perform. The SM is indexed to a Skill Qualification Test (SQT) and contains actual performance tests which can be administered by unit personnel. In short the SM is an individualized guide focused on how to train to the test.

Skill Qualification Test (SQT) - SQT's are tests to replace the old MOS test. The old test was a written examination while the SQT is performance oriented. This type of testing is in-step with the performance oriented concept and is flexible for the specific job assignments. (3:64)

Training Extension Courses (TEC) - TEC is basically an audio visual application for transferring courses of instruction from the proponent service school to the troop unit, to the company level. The TEC program began in 1972 and by March of 1976 over 8,000 lessons of performance oriented tasks had been published and made available in troop units. TEC lessons are cross referenced to SM's and SQT's and omit the theory or "nice to know" information while concentrating on performance of the task. TEC lessons cite TM's and FM's as additional reference material. The lessons are catalogued and provide programmed text, audio visual lessons, audio only

lessons, and skill practice exercises. They include both operator and maintenance courses. (19:113)

The media examples above are the primary media which directly support the concepts of decentralization and performance orientation. In addition, there are training devices and simulators, depending on the job and or the equipment, and general subject easy-to-read magazines made available at the site of the man-machine interface.

Organization

HQ TRADOC is the major command responsible for all training. There has evolved within TRADOC along with the new trends a supporting organizational structure. The capstone of the organization is the U. S. Army Training Support Center (USATSC) which manages the export of training to worldwide users. Under the management of USATSC is the TEC program, the Training Aids Services Office (TASO) of each TRADOC installation, and the Training Device Requirements Office (TRADER). TRADER works with a DARCOM project manager (PM TRADE) on development of non-system training devices to support the overall training programs. TEC, for example, is a non-system training device. (3:64) Systems-training-devices, that is, devices for a specific weapon system, are the responsibility of the managing PM. (17:C-7) System training devices, depending on the training plan, might go to service schools or to units receiving the equipments, or both. In order to insure compatibility, in training devices there is a coordination link between the system PM and PM TRADE as well as TRADER. Recently by a memorandum of understanding DARCOM and TRADOC jointly organized the Advanced Training System Office (ATSO) to stay abreast of the state of the art communicative systems and computerization in support of the exporting philosophy. (3:65)

Improved Technical Documentation and Training

In late 1975, a new program was begun as a pilot project which incorporates the newest training trends with improvements in technical documentation. The program is called Improved Technical Documentation and Training (ITDT). The concept centers on maintenance training. Under this concept those maintenance skills which lend themselves to decentralized training will be taught via training packages which are task-based, performance-oriented and self-paced which allows the student to proceed at his individual pace. This idea of self-pacing, in the unit, capitalizes on the theory that the motivation of the soldier is greater in the peer pressure environment of the unit. The packages are to be success oriented to provide positive reinforcement for those skills learned. (24:1)

The packages to be exported are developed from a front-end analysis of the job and tasks and gives the soldier what he needs to know to do his job. (29:1) The objective is that the output of the system acquisition include Extension Training Material (ETM) to be used in conjunction with Job Performance Manuals (JPM's) and Job Performance Guides (JPG's). JPG's will contain elementary tasks, access and enabling tasks, frequently repeated task subsequences, safety, first aid, and the use of basic tools. JPM's will be easily readable manuals for use in shop and field maintenance and will contain illustrations to guide the soldier in his task sequence. The JPM results from a functional analysis of the equipment. The ETM will be an extension course to teach the use of the JPM-JPG documents. They will be developed from the design and engineering data of new weapons systems. (25:II-2) Appendix A gives the basic relationship of the ETM development. Appendix B

gives the flow process of contractor and government actions in the development process.

While ITDT is currently a pilot project, it is receiving high visibility. HQ TRADOC and HQ DARCOM have agreed to a joint program to investigate the feasibility of the ITDT approach. In December of 1975 a working group of representatives from TRADOC, DARCOM, The Maintenance Management Center and the Human Engineering Laboratories published a draft Mil Spec M-632XX in two parts to be used in pilot projects. The approach is being demonstrated in both fielded systems (tank turret and two wheeled vehicles) and two developmental systems (battery computer system of TACFIRE and the XM1 tank). The pilot program has been funded at 4.5M in FY77 and follow-on programs are expected as additional funding becomes available. A General Officer steering committee has been appointed which includes nine members from DARCOM, TRADOC, FORSCOM, the U. S. Army Logistics Command and one major project office. (26:4)

The overall objective of ITDT is to reduce the down stream cost of ownership through effective maintenance training. In that regard a recent estimate provided to HQ DA was that

The recognized advantages of the concept are:

Reduced Error rate	75%
Reduced spares demand	30%
Reduced manpower demand	35%
Reduced time in training	25%
Overall MTTR reduction	40%
Increased front-end cost	50-100% (26:2)

A recognized risk of the concept is the realization that there could be excessive concern for media vis-a-vis the message. Sophisticated training media and the contractor expertise to produce a total training package can

add significantly to the total program cost as estimated above. On the other hand, a tailored media can pay dividends in the area of satisfying the needs of training in the reserve components and possibly in the area of FMS. (24:5)

The ITDT program is too new to analyze in total. Suffice to say that it is instep with the current trends in training and is indicative of the concern for downstream effectiveness which is of paramount importance to the Army's senior leadership, as evidenced by the membership of the steering committee.

Implications for the Project Manager

Since 1972, the Army has undergone major changes in its training concepts. It has moved from an institutionally based system to a dynamic system of decentralized training supported by relatively new techniques and media. Its basic trends, however, can be identified. It is performance oriented, that is, it is concerned with how the individual performs the task of his job. In that sense, it is people oriented. A basic ingredient is a front-end analysis of the job which is subdivided to the tasks necessary to perform the job. It considers the man, what skills he would have to be taught versus what he is already capable of, and further, what is the best instructional setting for him to learn the skill. It is success oriented in that it focuses on the performance required and seeks to train to the established criterion of evaluation.

How do these trends impact the PM of an Army weapon system?

In the conceptual phase the parameters of this new dynamic training environment are made a part of the PM's Outline Development Plan for

establishing the baseline system parameters. Therefore, the PM must be cognizant of the character of the new training environment and realize that it is not the fixed institutional system that existed prior to 1972.

In the follow-on phases the ILS training manager along with TRADOC training specialists are apt to play a more significant part in engineering changes. The training plan is based on the job and task analysis and each alteration during the system engineering process is likely to cause a resulting change in the training plan. Data requirements in the area of documentation (FM's and TM's) will be more critical. The requirements will result from a performance orientation for the user and the maintenance man to compliment the new training media. The PM must be aware of past inadequacies in user's technical data. Specifications for contractor preparation of data will require more tailoring and perhaps the format of the technical manuals will differ depending on the level of maintenance.

The cost of training, by virtue of the changing training environment, will be less easy to estimate, which means more difficulty in refining the life cycle cost estimate. The NET plan, laid out by the developer should mesh with the general training methodology of the forces to whom the equipment is deployed. The personnel and training portion of the ILS plan due to its interface with the total training environment will undoubtedly take on new emphasis. The number of functional specialist with whom the ILS training specialist works will obviously increase particularly in the area of media specialists and human factors engineering specialists.

For the project manager, the ITDT pilot program means that one of the subsystems of the total weapons systems acquisition process has the

increased attention of the user and the developer. It is focused on improving the end-result weapons system effectiveness by improving the technical documentation of the hardware in the hands of the ultimate user. ITDT proponents have produced a forecast of significant reduction in O&M costs, but a significant increase in front-end cost.

In terms of the process for integrating training the general flow should remain the same though the character of the training plan will be different. It raises the question of what becomes the mission of the NET team. Is it still equipment introduction oriented or does it become a mission of introducing a total training system to the unit receiving the equipment? (27)

In terms of the system engineering process it means that the functional training specialists are likely to play an even more active part, in that, the approach focuses significantly on the equipment from a human factors point of view emphasizing the skills required to maintain it and how those skills are taught.

In terms of what the PM turns out, the existing specification (Draft M-632XX) means that he will manage the development of a training system produced by the contractor to include the hardware/software, along with weapon system hardware. This implies a relook at his organization and the expertise he has to manage it. Managing the production of a training system implies additional items for configuration management. If the training package is produced by the contractor then it should be incorporated into testing. Thus, the complexity of the total system is increased.

In summary, the evidence is that training throughout the Army has received increased attention in the past few years. Therefore, it is to a lesser degree a likely candidate for cutting back in preference to other areas without scrutiny from a host of functional specialists. In order for the PM to effectively manage the development of a weapons system which will increase the overall effectiveness of the forces who are to use it, he must understand the environment in which it will be used. He must utilize the specialty organization within TRADOC whose mission it is to improve overall effectiveness through improved training. In order to effectively utilize that expertise the PM's training planning must keep pace with the changing training trends.

SECTION V

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the foregoing it is concluded that:

The PM of an Army weapons system actually inherits the general training concept for the proposed hardware. This is a result of the user-trainer (TRADOC) having considered the training subsystem in the analysis of feasible approaches to the operational capability objective. This concept is not a fixed, institutionalized training system.

The PM, in order to effectively integrate training into his overall project plan, must be familiar with the rationale for decentralized training and understand the focus, methodology, and media of the training trends. Further that the integration requires effective communications between the PMO, the designer, the human factors engineering specialist, and the training management organization.

The ITDT program is instep with the general training environment and has potential for attacking the high cost of ownership in the area of operations and maintenance.

Recommendations

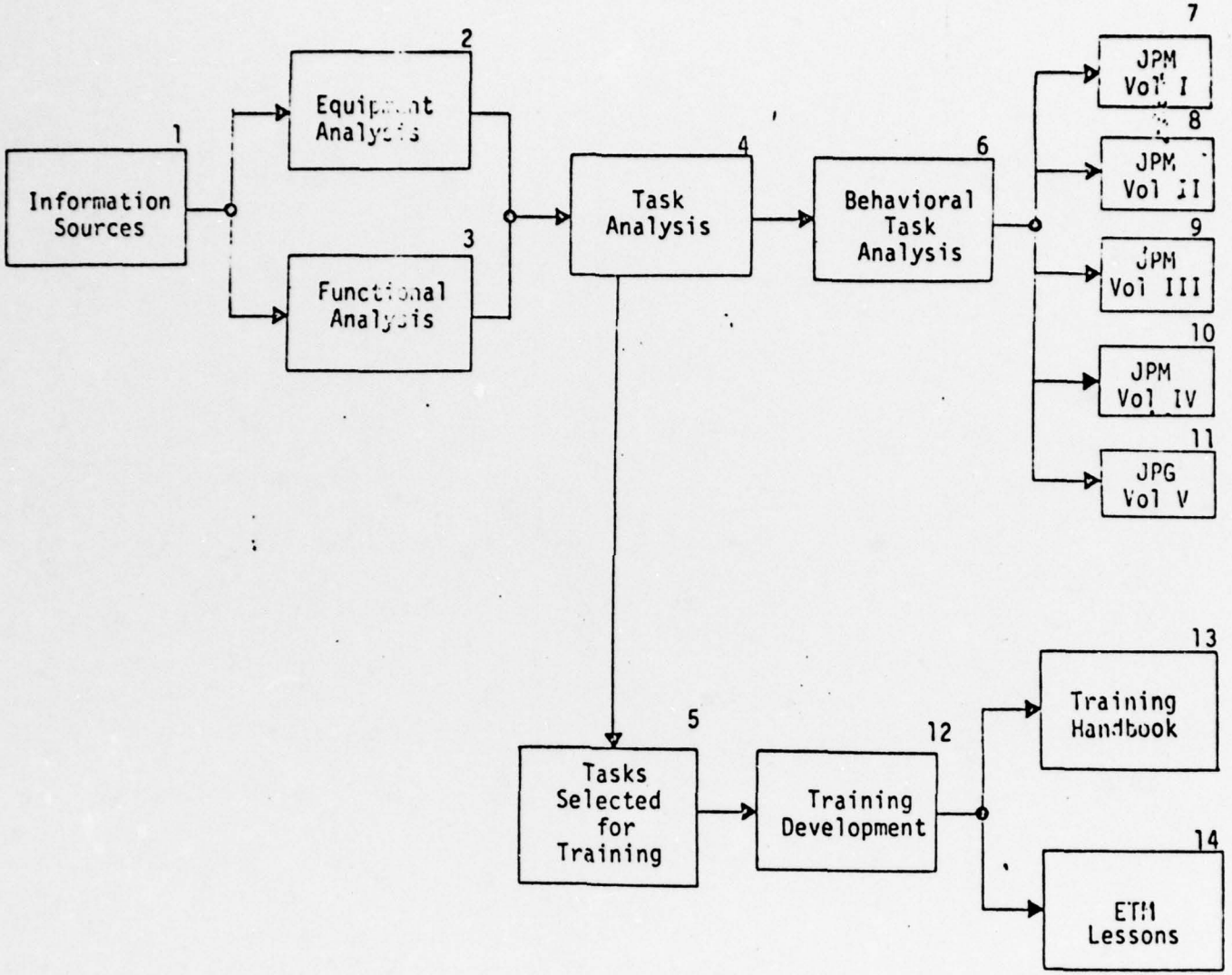
It is recommended that:

The PM insure that he is cognizant of the training environment. In view of the fact that some PM's may not have had command assignments, a program should be developed to educate those PM's on the Army's training policies. This should be done by TRADOC through a short orientation course for such PM's of major systems.

The PM should consider the organizational structure of his ILS organization to insure that he has the necessary strength within the personnel and training element. Additionally, he should consider, based on his own management style and that of his ILS manager, the techniques by which they best obtain the early commitment of functional training specialists to the support of the total training program for his project.

The ITDT program should continue to be monitored as a high visibility pilot project with a view toward critical evaluation for total integration of the concept into the acquisition process of all Army systems.

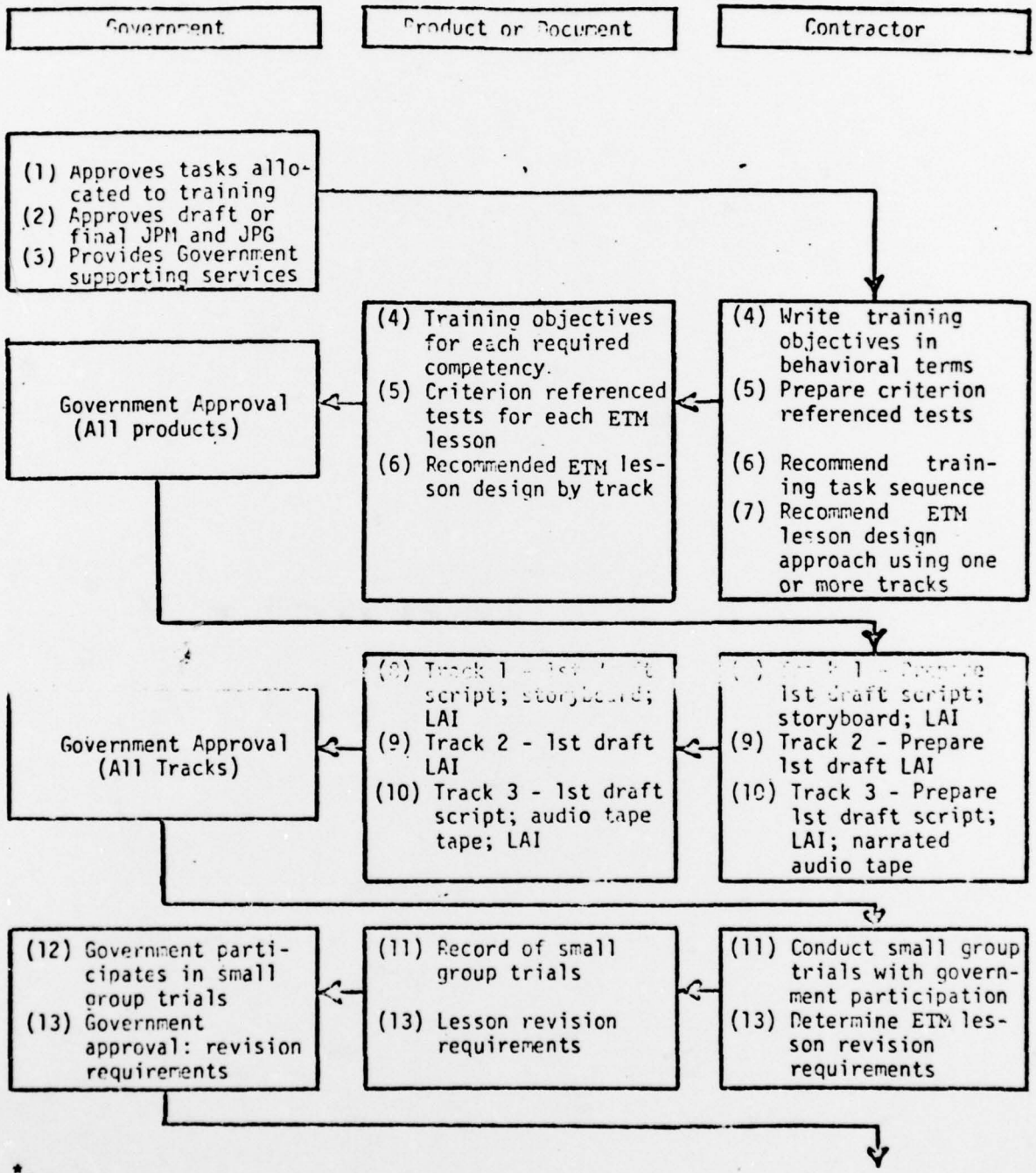
APPENDIX A



RELATIONSHIP OF TRAINING TO JPM/JPG DEVELOPMENT

ETM Lesson Development

by Contractor and Government Actions



*Submitted by contractors under Draft MIL-M-632XX(TM) Part I.

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APPENDIX B

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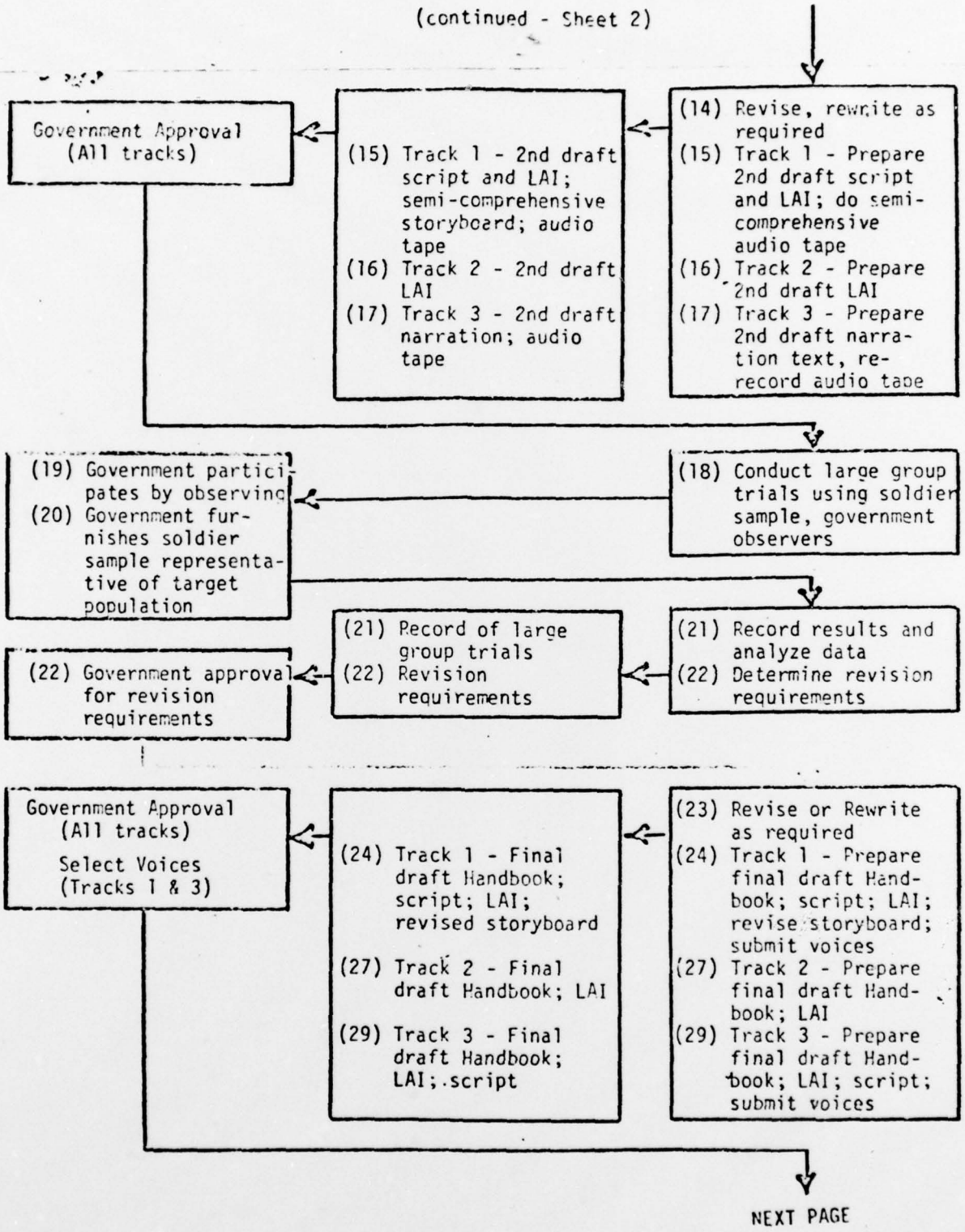

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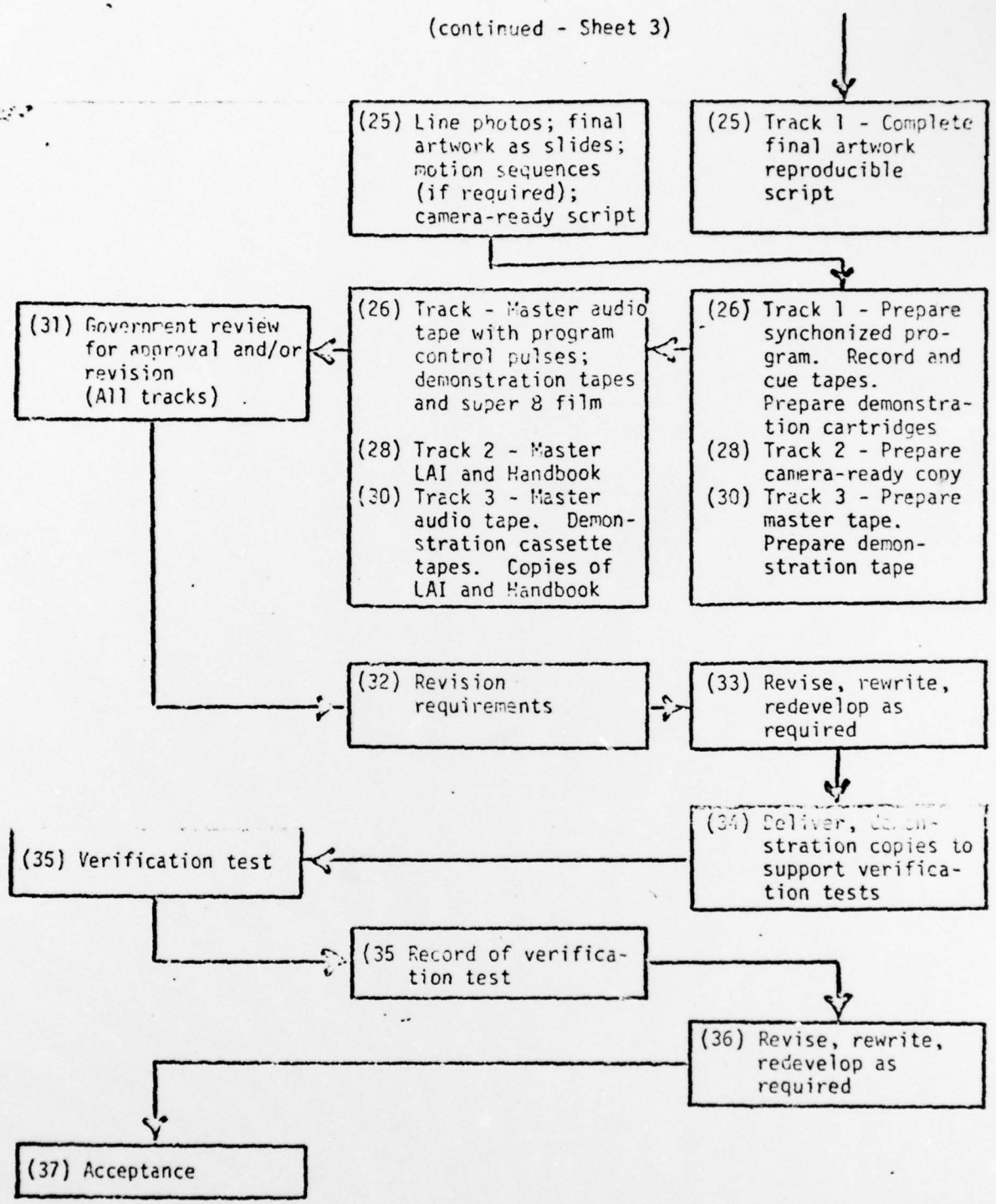

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